

The BACTER Institute at the University of Wisconsin -- Madison

The University of Wisconsin -- Madison announces the creation of the BACTER Institute, funded by a 3-year, \$3.67 million grant from the Department of Energy's Office of Science as part of the Genomics:GTL program. Lead by Prof. Julie Mitchell (Departments of Mathematics and Biochemistry), BACTER: Bringing Advanced Computational Resources to Environmental Research will bring a new paradigm of computational biology research and education to bear on the DOE goals of bioremediation and energy production.

The Offices of Advanced Scientific Computing Research (ASCR) and of Biological and Environmental Research (BER) in the Office of Science (SC), U.S. Department of Energy (DOE), are leveraging the success of the Human Genome Project and related sequencing efforts into an integrated, systemic approach to understanding the complexity of life. The goals of the DOE's Genomics:GTL (formerly Genomes to Life) initiative are nothing short of identifying and characterizing the entire pathway from sequenced genomes through molecular machines to whole-cell communities. Furthermore, recent advances in genomics and proteomics highlight the potential of using microbial organisms to solve some of our most intractable environmental problems. The research of the DOE-funded BACTER Institute will focus on two model microbial organisms, *Rhodobacter sphaeroides* and *Shewanella oneidensis*. Understanding the remarkable ability of these microbes to thrive under extreme environmental conditions will lead directly to new avenues for addressing the DOE missions of clean energy production and bioremediation.

Starting with the fully sequenced genomes of the two model organisms, the goal of research in the BACTER Institute is to find the genes, transcribe the proteins, predict the folds, perform pairwise docking of the model structures, deduce pathways, and ultimately construct whole cell models. BACTER will engage students in project oriented computational biology research through three interdependent research tracks: Genomics and Biological Pathway Analysis; Protein Dynamics, Folding, and Docking; and Macrobiological Modeling. The BACTER Institute will train students to uncover biological mechanisms and pathways within these microbial organisms through the use of computational biology and synergistic collaborations with experimental groups. Beginning with existing software tools, the BACTER research team will actively explore the relationship between genome sequence, protein structure, and macromolecular function. In future years, BACTER researchers will develop their own computational tools for the analysis of microbial genomes, molecular interactions, and signaling pathways.

To achieve these ambitious goals, the BACTER Institute is building an interdisciplinary team of faculty, postdocs, and graduate students from the rich environment at the University of Wisconsin -- Madison. In achievement and prestige, UW Madison is one of America's premier universities with one of the largest biological research communities in the world. BACTER-affiliated faculty hold appointments in departments which rank among the top few in the country, including Biochemistry, Chemistry, Computer Sciences, Microbiology, and Mathematics. In addition, the BACTER Institute joins a number of internationally recognized research centers and facilities at UW Madison, such as the Biotechnology Center, the Genome Center of Wisconsin, and the Nuclear Magnetic Resonance Facility.

The BACTER Institute is one of three new DOE institutes for the advancement of computational biology research and education; the others are at Johns Hopkins University in Baltimore and the University of California at Merced. The goal of all three institutes is to translate computational power into improved biological understanding to further the goals of the DOE Genomics:GTL program.